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Knowledge and Attitudes About Bioterrorism and Smallpox: A Survey of Physicians and Nurses

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Introduction

With the event of the anthrax attack of October 2001, many Americans are now aware of the possibility of a covert or overt release of a biological or chemical agent. Even though the concept of a biological attack has existed for centuries, it is now even more critical for public and private health professionals to be prepared for a possible event.

In addition to establishing effective working relationships with health care providers, public health professionals need to understand health care providers' knowledge and attitudes regarding bioterrorism in order to develop realistic community response plans. Very limited information is available assessing the knowledge, opinions, or concerns of Americans and health care professionals about bioterrorism. A nationwide survey, directed by the Harvard School of Public Health, indicated that in the event of an outbreak caused by bioterrorism, Americans would trust a senior scientist from the Centers for Disease Control and Prevention (CDC) followed by the head of the Department of Health and Human Services to provide correct information about how to protect themselves from the disease (1). The survey showed that Americans were also more likely to trust a senior scientist from the CDC followed by a local or state Department of Health to provide correct information about where to go if they thought they were exposed. When asked how confident they were that their doctor could recognize the symptoms of smallpox, most responded "very confident". According to the survey, Americans felt that local health department staff were "somewhat prepared" to prevent the spread of smallpox in an outbreak. There have, however, been no published surveys of what health care providers think regarding their own knowledge and attitudes about bioterrorism. Therefore, we surveyed a random sample of licensed physicians and nurses in Miami-Dade County, Florida to better understand their knowledge about bioterrorism and attitudes about providing care and vaccinating contacts in the event of a smallpox attack. Specifically, we hypothesized that physicians and nurses would be less likely to care for patients with smallpox if vaccinated *at* the time of a bio-terrorist event than if they were vaccinated *prior* to the event.

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Methods

A list of licensed physicians and nurses in Miami-Dade County was obtained from the Licensee Data Center, Florida Department of Health, Tallahassee, Florida. Of the 5,990 licensed physicians on the list, a sample of 350 (5.8%) physicians was randomly selected. Of the 13,381 licensed nurses and advanced registered nurse practitioners (ARNP), 350 (2.6%) were randomly selected. The resulting samples were revised to verify that the work address was in the zip code area of Miami-Dade County. Those that were not in the zip code range were removed leaving a total of 338 physicians and 347 nurses.

On April 9, 2002, an anonymous, self-administered one-page survey was mailed with an accompanying cover letter to the random samples of physicians and nurses. They were instructed to return the survey in a self-addressed, stamped envelope to the Miami-Dade County Health Department (MDCHD). To ensure anonymity, no information was requested that would identify the participants. A separate form and envelope to volunteer for participation in vaccination and quarantine efforts were included in the initial mailing so willing participants could volunteer. A reminder letter with another copy of the survey and envelope was mailed after 3 weeks to all physicians and nurses in the original samples.

The surveys were returned to the Office of Epidemiology and Disease Control, Miami-Dade County Health Department, where the data were analyzed using Epi-Info 2000 (Center for Disease Control and Prevention, Atlanta, GA) and SAS version 8.02 (SAS Institute Inc., NC, USA). The Chi-square test was used to test the difference in distribution of participant's willingness to give smallpox vaccine and care for smallpox patients depending on whether they were pre-vaccinated.

Results

Of the 338 surveys sent to physicians, 5 surveys were returned with a "no such street" or "unable to forward" stamp. Of the 333 physician surveys that presumably reached their destination, 134 (40.2%) physicians responded. Of the 347 surveys sent to nurses, 15 surveys were returned with the same indicated message stamped on the envelope. Of the 332 that presumably reached their destination, 121 (36.4%) nurses responded.

Characteristics of respondents: Of the 134 responding physicians, 125 indicated their sex, and 94 (75.2%) of those were males. Of the 121 responding nurses, 104 (86.0%) were females (Table 1). There was not a statistically significant difference in the sex distribution between responding physicians and nurses comparing with that of physicians and nurses in the licensing database (76.8% male physicians and 85% female nurses). Of the 134 physicians, 64 (47.8%) graduated medical school prior to 1980, and 47 (38.9%) of 121 nurses graduated prior to 1980. Almost all (94.0%) of physicians were currently working (this question was not asked of nurses). Twelve (9.9%) of the nurses were ARNPs. Regarding medical specialty, 35 (28.7%) of 122 physicians indicated internal medicine followed by 15 (12.3%) for pediatrics and 15 (12.3%) family medicine. A high proportion of responding physicians (11 of 134, 8.1%) were anesthesiologists. Because this survey was anonymous and some information was not available in the licensing database, it was not possible to determine if the non-responding physicians and nurses were different regarding graduation year, physician specialty, or nursing status (ARNP or non-ARNP).

Attitudes regarding vaccinating contacts and providing care during a smallpox event: Respondents were asked about their willingness to administer smallpox vaccine and care for patients with smallpox in the event of a smallpox outbreak assuming they had been properly trained, had the proper protective equipment, and were vaccinated *prior* to the event.

The majority of physicians and nurses strongly agreed or agreed that they would be willing to administer the smallpox vaccine if vaccinated *prior* to a smallpox event (78.0 and 68.6% respectively) (Table 2). However, nurses were significantly less likely to strongly agree or agree to administer vaccine if vaccinated *at* time of event compared with

prior to the event (53.4% vs. 68.6%, p=0.02). Only a minority of physicians and nurses (46.2% and 34.7% respectively) strongly agreed or agreed to care for patients if vaccinated *prior* to a smallpox event. This percentage decreased among physicians and nurses, but not significantly, if vaccinated *at* the time of a smallpox event.

Knowledge/training in bioterrorism: Only 22.9% of physicians and 7.6% of nurses respectively strongly agreed or agreed that they had sufficient education or training about bioterrorism (Table 3). In addition, only 21.4% of physicians and 6.8% of nurses felt that they were up-to-date about the signs, symptoms, treatment, incubation period, period of communicability and modes of transmission for anthrax, tularemia, botulism, smallpox, plague, and viral hemorrhagic fever. Only 51.5% of the physicians and 43.2% of nurses strongly agreed or agreed about knowing how to contact the health department in a suspected case of bioterrorism.

Of 134 physicians and 121 nurses, 130 (97.0%) and 111 (91.7%) respectively are interested in a training related to bioterrorism. Physicians and nurses (74.6% and 66.9% respectively) were interested in training about recognizing a potential bioterrorist event. In addition, 71.6% of the physicians and 67.8% of the nurses expressed an interest in training about a community response to a bioterrorist event. When asked how physicians would like to receive training, 71 (54.6%) of 130 physicians indicated by seminar, 46 (35.4%) by video, 38 (29.2%) by CD/Rom or article, and 36 (27.7%) by Internet. The least preferred way of receiving training was through tapes 19 (14.6%), teleconference 12 (9.2%), and conference calls 5 (3.9%). Of the 111 nurses who are interested in the training, 72 (64.9%) indicated by seminar, 55 (49.6%) by video, 42 (37.8%) by articles, 41 (36.9%) by Internet , and 26 (23.4%) by CD/Rom. Like the physicians, the least preferred ways for nurses were tapes 17 (15.3%), teleconference 7 (6.3%), and conference call 6 (5.4%).

Volunteers: Of the 111 nurses and physicians who returned the volunteer form indicating they were interested in volunteering, 53 (48.6%) are physicians, 54 (49.5%) are nurses, and 4 (3.6%) are unknown. There are 87 (78.4%) who would be interested in helping with vaccination, 40 (36.0%) in assessing contacts for chemoprophylaxis, 68 (61.3%) in providing information to contacts about disease, transmission, and preventive therapy, 51 (45.9%) in helping with the telephone hotline providing information to the public, and 29 (26.1%) in caring for patients in an isolation facility.

Table 1. Characteristics of physicians and nurses who participated in survey, Miami-Dade, April 2002

	Physicians (n=134)		Nurses (n=121)	
	N	%	N	%
Sex				
Female	31	23.1	104	86.0
Male	94	70.1	17	14.0
Unknown	9	6.7		
Graduate				
Prior to 1970	41	30.6	21	17.4
1971-79	23	17.2	26	21.5
1980-89	49	36.6	38	31.4
Since 1990	18	13.4	24	19.8
Unknown	3	2.2	12	9.9
Status[1]				
Working	126	94.0		
Not working	7	5.2		
Unknown	1	0.7		
Physician specialty				
Anesthesiology	11	8.2		
Dermatology	2	1.5		
Emergency medicine	3	2.2		
Family medicine	15	11.2		
General practice	8	6.0		
Internal medicine[2]	35	26.1		
Neurology	2	1.5		
Obstectric-Gynecology	2	1.5		
Pathology	2	1.5		
Pediatrics	15	11.2		
Psychiatry	5	3.7		
Radiology	5	3.7		
Surgery[3]	16	11.9		
Unknown	13	9.7		
Nursing level	134			
ARNP			12	9.9
RN			100	82.6
Unknown			9	7.4

[1]Question was not asked to nurses.

[2]Includes allergy, ambulatory care, cardiology, critical care, endocrinology, gastroenterology, geriatric medicine, immunology, nephrology, pulmonology, and rheumatology.

[3]Includes colorectal, cosmetic, general, orthopedic, ophthalmology, otolaryngology, plastic, tranplant surgery, and urology.

Table 2. Physician and nurse attitudes in willingness to administer smallpox vaccine and care for patients with smallpox, Miami-Dade, April 2002

	Vaccinated PRIOR to a smallpox event[a]		Vaccinated AT of time smallpox event[b]		P value
	N	%	N	%	
Strongly agree/agree to *vaccinate*					
Physicians (n=132)	103	78.0	90	68.2	0.07
Nurses (n=118)	81	68.6	63	53.4	0.02
Strongly agree/agree to *care*					
Physicians (n=132)	61	46.2	56	42.4	0.54
Nurses (n=118)	41	34.7	38	32.2	0.68

Note: For analysis purpose, two physicians and three nurses were not included due to missing information.

Note: The wording of the questions was as follows: Assuming I had been properly trained, vaccinated *prior* or *at* the smallpox

[a] I would be willing to help administer smallpox vaccine.

[b] I would be willing to care for patients with smallpox in an isolation facility.

Table 3. Physician and nurse responses on training and knowledge pertaining to bioterrorism, Miami-Dade, April 2002

	Strongly agree/agree		Neutral		Strongly disagree/disagree	
	N	%	N	%	N	%
Education/training[1]						
Physicians (n=131)	30	22.9	39	29.8	62	47.3
Nurses (n=118)	9	7.6	13	11.0	96	81.4
Up-to-date[2]						
Physicians (n=131)	28	21.4	37	28.2	66	50.4
Nurses (n=118)	8	6.8	16	13.6	94	79.7
Contacting health department[3]						
Physicians (n=130)	67	51.5	22	16.9	41	31.5
Nurses (n=118)	51	43.2	11	9.3	56	47.5
Familiar with smallpox vaccination[4]						
Physicians (n=132)	26	19.7	22	16.7	84	63.6
Nurses (n=118)	16	13.6	9	7.6	93	78.8

Note: for analysis purpose, three to four physicians and three nurses were not included due to missing information.

Note: the wording of the questions was as follows:

[1] I have had sufficient continuing education/training about bio-terrorism.

[2] I am up-to-date about the signs, symptoms, treatment, incubation period, peroid of communicability and modes of transmission for anthrax, tularemia, smallpox, plague, and viral hemorrhagic fever.

[3] I know how to contact the health department if I suspect a case of bio-terrorism event.

[4] I am familiar with smallpox vaccine storae, handling, administration, and adverse affects.

Discussion

There have been reports about levels of preparedness in health care facilities for biological and chemical terrorist attack (2, 3). To our knowledge, however, this is the first report about the knowledge and attitudes of physicians and nurses regarding bioterrorism.

In our study, we had hypothesized that physicians and nurses were more likely to care for patients with smallpox if vaccinated *prior* to a smallpox event. However, we found that the time of vaccination did not significantly affect the willingness of physicians and nurses to provide care to smallpox patients. It may be that the physicians and nurses did not understand the question. Alternatively, the minority of physicians and nurses who are willing to provide care may know about the effectiveness of the vaccine if given shortly after exposure.

The low percentage of physicians and nurses agreeing to provide care even if pre-vaccinated has important ramifications. If there were a smallpox outbreak, health care providers are crucial to our ability to control the outbreak. The concern about providing care suggests that education of health care providers about smallpox and the effectiveness of the vaccine are greatly needed. It has been difficult to evaluate vaccine efficacy because the available data are based on attack rates among population vaccinated when the potency of the vaccine and methods of administration were not standardized. In addition, the definition of "vaccinated" was based on the presence of a scar, which was sometimes due to a bacterial infection. However, the best information indicates that the efficacy of vaccination is at least 90.7% to 97.1% (4). For those not vaccinated and exposed to a smallpox case, getting vaccinated within the first few days may prevent the severity of smallpox or reduce the severity of illness (5).

The majority of physicians and nurses reported a need for more training in bioterrorism and bioterrorist agents and did not feel that they were up-to-date about the bioterrorist agents. Based on responses, seminars and videos may be the most effective training modes. Only a minority indicated that they would like to be trained by computer-based methods (CD-ROM or Internet).

It is very concerning that only 51.5% of physicians and 43.2% of nurses indicated that they knew how to contact the health department. This is consistent with a survey of health care institutions in Nebraska which found that only 9.9% of surveyed institutions named the health department or public health laboratory as the contact in the case of a bioterrorist event (2). Every year, the Miami-Dade County Health Department sends a mailing to physicians about reporting requirements of reportable diseases. This mailing includes information about how to contact health department staff 24 hours a day. Clearly, additional strategies to reach health care providers must be developed.

The most important limitation to this survey is the low response rate for physicians and nurses. We suspect that those that responded would be more likely to provide care and administer vaccine in case of a smallpox outbreak since they took the time to complete the questionnaire. If this is true, the percentage of physicians and nurses who will be likely to participate is even lower than what we have reported.

Despite this limitation, it is clear that physicians and nurses feel that they need more education and training in bioterrorism and that the Miami-Dade County Health Department must develop alternative strategies to communicate with physicians and nurses. It is also clear that more effective marketing is needed of the MDCHD, what we do, and how/when to reach us.

Finally, there was a minority of physicians and nurses who are willing to volunteer and participate in a community response. This information will aid in our planning effort and will help us to carry out our proposed plan if an event were to occur.

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To report diseases or for information:

Office of Epidemiology and Disease Control

Childhood Lead Poisoning Prevention Program	(305) 324-2414
Hepatitis	(305) 324-2490
Other diseases and outbreaks	(305) 324-2413
HIV/AIDS Program	(305) 324-2459
STD Program	(305) 325-3242
Tuberculosis Program	(305) 324-2470
Special Immunization Program	(305) 376-1976
Nights, weekends, and holidays	**(305) 377-6751**

Monthly Report
Selected Reportable Diseases/Conditions in Miami-Dade County, June 2002

Diseases/Conditions	2002 this Month	2002 Year to Date	2001 Year to Date	2000 Year to Date	1999 Year to Date	1998 Year to Date
AIDS *Provisional	93	589	701	662	785	794
Campylobacteriosis	10	48	51	48	62	32
Chancroid	0	0	0	0	0	1
Chlamydia trachomatis	273	1916	1612	1579	2302	942
Ciguatera Poisoning	0	0	0	0	0	0
Cryptosporidiosis	1	4	8	1	4	6
Cyclosporosis	1	1	0	0	0	1
Diphtheria	0	0	0	0	0	0
E. coli , O157:H7	0	0	0	1	0	2
E. coli , Other	0	1	0	0	0	1
Encephalitis	0	0	0	0	0	0
Giardiasis, Acute	32	102	129	22	33	20
Gonorrhea	129	902	789	1090	1580	698
Granuloma Inguinale	0	0	0	0	0	0
Haemophilus influenzae B (invasive)	0	0	1	1	0	0
Hepatitis A	6	71	70	37	36	71
Hepatitis B	0	12	24	19	16	36
HIV *Provisional	141	952	727	764	728	791
Lead Poisoning	38	140	103	N/A	N/A	N/A
Legionnaire's Disease	1	1	0	0	0	1
Leptospirosis	0	0	0	0	0	0
Lyme disease	0	0	4	3	0	0
Lymphogranuloma Venereum	0	0	0	0	0	2
Malaria	0	5	10	15	12	13
Measles	0	0	0	0	0	0
Meningitis (except aseptic)	1	8	8	8	15	13
Meningococcal Disease	2	10	11	13	10	9
Mumps	0	0	0	1	2	0
Pertussis	2	3	1	4	8	11
Polio	0	0	0	0	0	0
Rabies, Animal	0	0	0	0	0	1
Rubella	0	0	0	0	0	0
Salmonellosis	23	120	95	67	115	94
Shigellosis	20	100	47	59	51	107
Streptococcus pneumoniae, Drug Resistant	9	70	106	105	89	51
Syphilis, Infectious	20	95	100	72	34	16
Syphilis, Other	62	442	328	409	444	303
Tetanus	0	0	1	0	0	0
Toxoplasmosis	2	12	6	0	0	0
Tuberculosis *Provisional	28	121	95	119	126	143
Typhoid Fever	0	1	0	0	14	2
Vibrio , *cholera*	0	0	0	0	0	0
Vibrio , Other	0	0	0	0	0	1

* Data on AIDS are provisional at the county level and are subject to edit checks by state and federal agencies.
** Data on tuberculosis are provisional at the county level.